

Appln. No.: 10/775,828
Amendment Dated January 23, 2006
Reply to Office Action of September 30, 2005

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Amendments to the Claims: This listing of claims will replace all prior versions, and listings, of claims in the application

Listing of Claims:

1. (Currently Amended) ~~A ACE multiplicatively-indenting plunger pin configured for slidable retention in a carrier frame of a package testing apparatus, the plunger pin comprising:~~
 - a. ~~a center axis substantially parallel with an impinging direction of said plunger pin~~ a first section having a first diameter, the first section being adjacent a first end portion of the plunger pin, the first end portion being configured for contact with an anisotropic conductive elastomer (ACE) of a package testing apparatus;
 - b. a second section having a second diameter, the second section being adjacent a second end portion of the plunger pin; and
 - c. a third section having a third diameter, the third section being disposed between the first section and the second section, the third diameter being less than both the first diameter and the second diameter; a back surface substantially rotationally symmetric with respect to said center axis, said back surface having a continuous curvature that is at a maximum radius in proximity of said center axis and decreases towards a back circumference of said plunger pin.
2. (Currently Amended) ~~The ACE multiplicatively-indenting plunger pin of claim 1, wherein said back surface seamlessly transitions into said back circumference~~ the first end portion defines a continuous curved tip configured for contact with the ACE.
3. (Currently Amended) ~~The ACE multiplicatively-indenting plunger pin of claim 1, wherein said back surface~~ the continuous curved tip has a surface height that is at least equal ~~configured to an indenting depth of said back surface in~~ extend into said ACE during contact therebetween.

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4. (Currently Amended) The ~~ACE multiplicatively indenting plunger pin~~ of claim ~~±2~~, wherein ~~said a maximum radius of the continuous curved tip~~ is infinite.

5. (Currently Amended) The ~~ACE multiplicatively indenting plunger pin~~ of claim 1, wherein ~~said back surface is~~ the continuous curved tip has an ellipsoid shape with a short axis of said ellipsoid's central cross section substantially coincides with said center axis.

6. (Currently Amended) The ~~ACE multiplicatively indenting plunger pin~~ of claim 1, further ~~comprising a guide section extending along said center axis~~ wherein the plunger pin is a solid plunger pin.

7. (Currently Amended) The ~~ACE multiplicatively indenting plunger pin~~ of claim ~~6~~, wherein the second diameter is less than the first diameter ~~said back circumference is independent of a guide circumference of said guide section.~~

8. (Currently Amended) The ~~ACE multiplicatively indenting plunger pin~~ of claim 1, further ~~comprising a recess section having a finite length along said center axis, said recess section having a recess circumference that is offset from said guide circumference in direction towards said center axis~~ wherein the second end portion includes a crowned portion defining a plurality of crown tips.

9. (Currently Amended) The ~~ACE multiplicatively indenting plunger pin~~ of claim ~~6~~ wherein the plunger pin is configured to be slidably slide ably held in the a guiding perforation of a carrier frame, said guiding perforation being correspondingly shaped with said guide section such that said plunger pin slides in a guided fashion along said center axis.

10. (Currently Amended) The ~~ACE multiplicatively indenting plunger pin~~ of claim 9, further ~~comprising a recess section having a finite length along said center axis, said recess section having a recess circumference that is offset from said guide circumference in direction towards said center axis and wherein said guiding perforation further comprises a retention flange corresponding to said recess section such that said~~ wherein the plunger pin is configured to slide able within the carrier frame along a path length defined by the length of the second limits defined by the recess section minus a height of said a retention flange of the carrier frame configured to retain the plunger pin therein.

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11. (Currently Amended) The ~~ACE multiplicatively indenting plunger pin of claim 101,~~ wherein the second end portion includes a crowned portion defining a plurality of crown tips, the crowned portion having an outer diameter that is less than the first diameter~~said carrier frame is of a material composition and said retention flange is in an offset from said guide circumference towards said center axis such that said retention flange may be non-destructively resiliently deformed during assembly insertion of said plunger pin into said guiding perforation.~~

12. (Currently Amended) The ~~ACE multiplicatively indenting plunger pin of claim 1,~~ wherein the second end portion includes a crowned portion defining a plurality of crown tips, further comprising ~~a pin front end having a number of the crown peaks tips being substantially rotationally symmetric arrayed in a substantially symmetric orientation about a center point of the second end portion with respect to said center axis.~~

13. (Currently Amended) A ~~multiple package testing probe apparatus comprising:~~

- a. a substrate including a plurality of base contacts;
- b. an anisotropic conductive elastomer (ACE) having a top surface and a bottom surface, wherein portions of the said top surface are configured to be in is-in-conductive contact with at least a portion of the contacts of the substrate~~said base contact;~~
- c. a carrier frame having a guiding means extending between a top and a bottom of said carrier frame, said frame top being immediately adjacent the bottom surface of the ~~to said ACE bottom;~~ and
- d. a plurality of plunger pins configured for slidable retention by the carrier frame, each of the plunger pins including ~~for transmitting an electrical current, said plunger pin having:~~
 - a. a first section having a first diameter, the first section being adjacent a first end portion of the plunger pin, the first end portion being configured for contact with the bottom surface of the ACE ~~a center axis~~

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~~substantially parallel with an impinging direction of said plunger pin and
substantially aligned with said guiding means;~~

b. a second section having a second diameter, the second section being adjacent a second end portion of the plunger pin a back surface substantially rotationally symmetric with respect to said center axis, said back surface having a continuous curvature that is at a maximum radius in proximity of said center axis and decreases towards a back circumference of said plunger pin such that for a given indenting depth of said back surface into said ACE bottom a relevant deformation in an impinging vicinity of said ACE remains on an overall minimum, said impinging vicinity being immediately adjacent to said impinging back surface; and

c. a third section having a third diameter, the third section being disposed between the first section and the second section, the third diameter being less than both the first diameter and the second diameter a guiding feature corresponding to said guiding means such that said plunger pin is moveable along said center axis at least up to said indenting depth; and

d. ~~an electrically conductive pin front end~~

~~such that an insulated conductive path is established between said pin front end and said base contact and such that simultaneously an opposing force is exerted from said ACE via said back surface onto said plunger pin while said plunger pin is displaced in one of multiple displacements with said indenting depth along said center axis in direction of said ACE.~~

14. (Currently Amended) The probe package testing apparatus of claim 13, wherein the first end portion of the plunger pins defines a continuous curved tip configured for contact with the ACE said back surface seamlessly transitions into said back circumference.

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15. (Currently Amended) The package testing probe-apparatus of claim ~~13~~14, wherein the continuous curved tip said back surface has a surface height that is at least equal~~configured to said indenting depth extend into said ACE during contact therebetween.~~

16. (Currently Amended) The package testing probe-apparatus of claim ~~13~~14, wherein said a maximum radius of the continuous curved tip is infinite.

17. (Currently Amended) The package testing probe-apparatus of claim 13, wherein said the continuous curved tip has back surface is an ellipsoid shape with a short axis of said ellipsoid's central cross section substantially coincides with said center axis.

18. (Currently Amended) The package testing probe-apparatus of claim 13, wherein the second diameter is less than the first diameter~~said guiding feature is a guide section extending along said center axis.~~

19. (Currently Amended) The package testing probe-apparatus of claim ~~18~~13, wherein the second end portion includes a crowned portion defining a plurality of crown tips~~said back circumference is independent of a guide circumference of said guide section.~~

20. (Currently Amended) The package testing probe-apparatus of claim 18, wherein the plunger pins are configured to be slidably held in the carrier frame by a resilient flange of the carrier frame~~said guiding feature is a guiding perforation correspondingly shaped with said guide section such that said plunger pin slides in a guided fashion along said center axis.~~

21. (Currently Amended) The package testing probe-apparatus of claim 20, wherein the plunger pins are configured to slide within the carrier frame along a path length defined by the length of the second section minus a height of a retention flange of the carrier frame~~configured to retain the plunger pin therein wherein said plunger pin further comprising a recess section having a finite length along said center axis, said recess section having a recess circumference that is offset from said guide circumference in direction towards said center axis and wherein said guiding perforation further comprises a retention flange corresponding to said recess section such that said plunger pin is slide able within limits defined by the recess section minus a height of said retention flange, said limits being at least equal to said indenting depth.~~

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22. (Currently Amended) The package testing probe-apparatus of claim 21, wherein ~~said carrier frame is of a material composition and said~~the retention flange is in an offset from said guide circumference towards said center axis such that said retention flange may be ~~is non destructively resilient such that the~~ ly deformed during assembly insertion of said plunger pins may be inserted into the carrier frame such that the second section of each of the plunger pins is positioned adjacent the retention flange into said guiding perforation.

23. (Currently Amended) The package testing probe-apparatus of claim 13, wherein each of the plunger pins are solid plunger pins~~said pin front end has a number of crown peaks substantially rotationally symmetric arrayed with respect to said center axis.~~